



SAN BERNARDINO MICROWAVE SOCIETY, Incorporated

FOUNDED IN 1955

A NON-PROFIT AMATEUR TECHNICAL ORGANIZATION DEDICATED
TO THE ADVANCEMENT OF COMMUNICATIONS ABOVE 1000 MC.

SBMS (W6IFE) Newsletter For September 2013

Tech Talk for the September 5th Meeting

*Walter Clark will show a slide version of the SBMS Website article:
Inexpensive, Easy to Build Microwave Transceiver; the DROplexer.
The text in the website has as its target audience the general ham
community. The slide show version has as its target audience the SBMS
members where the purpose is to use the members to catch mistakes and
improve understanding of the website version.*

Activities of the San Bernardino Microwave Society

Based on Notes Taken at the Meeting of 1 August 2013 in Corona

Guests or Members Not Seen In a Long Time

- Steve Wylde KX6J Temecula (Warner Springs)
- Todd Voigts KJ6DGG Aguanga (Now active in VHF and looking to see what microwave is all about.)

Members and Guests by Way of ATV at the July Meeting

- Gary Hester was absent this day.
-

Important Points of the August Business Meeting

Dick Kolbly Estate Sale

- October 6. This is put on by Ken Kolbly, Dick's son, also a member of SBMS.
 - Ed Munn thanked Walt Clark for the Newsletter
 - Dick Bremer got in the mail something from the IRS which Jeff will look into.
-

What Our Members Are Working On

- **Pat Coker N6RMJ**
has been working on Lazarus (has in the past been brought up from the dead). It now has a new Down East amplifier and dropped 18 pounds off the unit so it is much more portable. It only takes two minutes to set it up.
- **Jeff Fort KN6YR**
is helping Eric, his son, with a lighting project that Jeff doesn't sound too keen on.
- **Larry Johnston K6HLH**
His tower is down and putting on a 10 GHz Omni next to the dish. Also new is a 45 element Yagi for 1296.
- **Dennis Kidder W6DQ**
 - bragged about how quiet the new QTH is
 - Dennis joined Dan Slater on the south facing hills of La Habra Heights and worked the guys on the Wednesday before the meeting. He worked Dave, WA6CGR; Tony, KC6QHP; Courtney, N5BF, and Rein, W6SZ. He couldn't hear Dick, WB6DNX, but then no one else could either.
 - He discussed using the new PLL based satellite LNBS with the FunCube Pro dongle. Dan was able to copy everyone I did with only the feedhorn that comes with the LNB.
 - Played with the Agilent FieldFox some more.
- **Walt Clark**
 - brought in his Radar Gun he hacked out of a Mattel toy.
 - He also showed his experiments with coax to round transitions and his use of the FieldFox for making them work well at 10.370 GHz

- **Marty Woll N6VI**

- Said the ARRL accepted the Band Plan for 5 and 10 GHz
- He's working on his car roof-top rig so he improve four of the bands



- He's mounting a 2' dish for the August contest

Marty N6VI upgraded from last year's 12" dish to a 24" one for the 2013 ARRL 10 GHz & Up contest. Despite the extra wind load, this station is fully mobile and requires no setup once a site is reached other than to point the antenna from inside the vehicle.

- **Ed Munn W6OYJ**

- His main effort is documenting the results of the tune-up
- He talked philosophically about the results of the tune-up.
- He is presently in Main visiting relatives we presume.

- **Dick Bremer WB6DNX**

was preparing his rig for the tune-up

- **Chris Shoaff N9RIN**

has been working on one rig which he will bring out to the contest

- **Mel Swanberg WA6JDB**

- Tuned up one of Dan's slot-array antenna.
- Worked with some guys on RF safety
- He led an informal discussion on RF safety including some humorous examples of stupid microwave tricks

- **Brian Thorson AF6NA**
got a 10 GHz LNA operational and studying tropo ducting.
- **Dan Welch W6DFW**
still making parts for AMSAT. He only made a few antennas. He wants his ad pulled.
- **Frank Kromann AG6QV**
has not yet assembled the new LCD. He has purchased the components and created a PCB layout but still needs to make the PCB or find somewhere to get in manufactured. He was able to use the LED display currently in the radio during the test by wrapping my head and the radio in a towel. (Could I have copied that wrong? –ed)
- **Brian Thorson AF6NA**
 - Frank Fist to show up with working rig.
 - Will drive up north with Frank
 - Did some exposure studies
 - Was inspired by Dennis's talk about frequencies under 10GHz and intends to go on 2,304 MHz soon. He even brought some cans he intends to use for antennas.



- **Courtney Duncan N5BF**
Using Brian's loaner, *The AF6NA Barstool 3W 10 GHz rig*, Courtney made his first three X-Band contacts on activity night, 7/31. Here's Courtney with Brian Thorson's rig. That was Solana Beach, DM13ia from which we successfully worked Santa Barbara, Signal Hill, and everyone on Frazier. Listened for Mel and Arizona but nothing heard from there.



Courtney Duncan's Photographic Record of the 10 GHz and Up Contest

Brian, AF6NA, working Frazier and Santa Barbara from Solana Beach (DM13ia).



Neighborhood overlook in San Clemente (DM13ek) where model airplane flying is prohibited.



Courtney, N5BF, and Brian, AF6NA, point different directions from Huntington Beach (DM03xq) to each work Chris, N9RIN, at Mt. Soledad.



Courtney, N5BF with the SBMS 3W Barstool packed and ready to roll.

Here's a Courtney's record of the Tune Up













Is it 3dB or 6 dB?

By Walter Clark

In a previous SBMS Newsletter I showed a trick that makes it look like you think in dBm; instead of the more provincial milliwatts or watts. There are a few numbers you were to have memorized. They are circled in this table . . .

You were then shown a trick for milliwatt levels that have twos in the front; as in 20 mW, or 200 mW where you add 3 dB. And fives, like 0.5 mW, or 500 mW where you subtract 3 dB.

This table has to do with power where 0 dBm is 1 milliwatt. Hence the m in

dBm to Watt Conversion Table

dBm	Watts	dBm	Watts	dBm	Watts
0	1.0 mW	16	40 mW	32	1.6 W
1	1.3 mW	17	50 mW	33	2.0 W
2	1.6 mW	18	63 mW	34	2.5 W
3	2.0 mW	19	79 mW	35	3.2 W
4	2.5 mW	20	100 mW	36	4.0 W
5	3.2 mW	21	126 mW	37	5.0 W
6	4 mW	22	158 mW	38	6.3 W
7	5 mW	23	200 mW	39	8.0 W
8	6 mW	24	250 mW	40	10 W
9	8 mW	25	316 mW	41	13 W
10	10 mW	26	398 mW	42	16 W
11	13 mW	27	500 mW	43	20 W
12	16 mW	28	630 mW	44	25 W
13	20 mW	29	800 mW	45	32 W
14	25 mW	30	1.0 W	46	40 W
15	32 mW	31	1.3 W	47	50 W

dBm.

The most important point is that dBm is another way of saying milliwatts or watts.

But what about changes in voltage? Same table?

It's similar,

except there's no volt values in the table. When you use dB instead of dBm, there are no measurable values tied to dB numbers. You have to provide your own reference; that is, a

dB	Volts
0	
1	

dB	Volts
16	
17	

db	Volts
32	
33	

measured voltage with respect to another measured voltage; a ratio of voltages.

dB	Ratio
0	same
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	ten times
11	
12	
13	
14	
15	

dB	Ratio
16	
17	
18	
19	
20	hundred times
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	thousand times
31	

dB	Ratio
32	
33	
34	
35	
36	
37	
38	
39	
40	ten thousand
41	
42	
43	
44	
45	
46	
47	

As everyone knows, dB has to do with logs which means that a difference (one dB value subtracted from another dB value) corresponds to one measured value *divided* by another. Or conversely, when measured values are *multiplied*, their dB values add. That is useful because in electronics, value changes are huge; orders of magnitude is a phrase often used and adding these orders can be easier than multiplying. For example, a horn may “add” 17 dB to what the detector would normally sense. The first preamp may “add” 40 dB more. That’s 17 plus 40. The filter that follows subtracts 7 dBm followed by a mixer which subtracts another 3 dB and so on. What is actually going on is, a factor of 50 times 10,000 divided by 5 then finally divided by another factor of 2. Some of us feel that dB is a hangover from the days before calculators. Today it is useless except for its value as a secret handshake. Like the Morse code, it does give the hobby an air of superiority; a priesthood that’s fun to be in.

What follows are some tricks to make it look like you are part of the priesthood of dB. Again, rather than referring to the math, memorize some key places on the table...

dB	Ratio
0	same
1	
2	
3	twice
4	
5	
6	
7	five times
8	
9	
10	ten times

Check the table above for an amplifier with a voltage gain of ten thousand. Yes, that’s 40 dB of gain. That’s voltage out divided by voltage in. Notice the similarity to the dBm table. It is the same if you drop the “W” units which means that zero is not 1 mW but just plain 1 or rather “the same”. Let’s now fill out the table with all the easy values we can calculate in our heads. (It’s the same trick with numbers you saw in the dBm table two months ago.)

Notice that the fields with “five” are 3 dB less than the multiple of ten above them. (They are half of the multiple of ten above them). The dB-volts table with the blank column in it, is a graphic way for you to remember that you have to provide your own reference; one measured value as a ratio to another measured value.

dB	Ratio	dB	Ratio	dB	Ratio
0	same	16		32	
1		17	fifty times	33	two thousand
2		18		34	
3	twice	19		35	
4		20	hundred times	36	
5		21		37	five thousand
6		22		38	
7	five times	23	two hundred	39	
8		24		40	ten thousand
9		25		41	
10	ten times	26		42	
11		27	five hundred	43	20 thousand
12		28		44	
13	twenty times	29		45	
14		30	thousand times	46	
15		31		47	50 thousand

Why is that? Why does power have its dB scale fixed at 1 mW? Whereas for voltage there is no absolute value? Usage. Power is most often used to indicate an actual number of watts where voltage is usually used as a ratio. Mel Swanberg who was my advisor on this article, told me that sometimes voltage is referenced; 1 microvolt is used as the reference but then then the letters “dB” are changed to dB μ V. So 30 dB μ V is 1000 microvolts. There is also dB μ V/m for absolute electric field measurements. And several others. But without the extra letters after dB, it can only be used as a ratio of two numbers where both numbers are in the same units.

6 dB vs. 3dB

But when does 6 dB correspond to a factor of two? The answer is “never”. That’s my opinion anyway. But when you do see 6 meaning a doubling, it is seen when voltage and power are used at the same time. It is my suggestion to not do that. If you are doubling in voltage and you want to say what that does in watts, reduce confusion by talking about a ratio of two voltages in dB and then in another sentence what that does to power in dBm if you like. As you will see below a 3dB increase in voltage (a doubling) quadruples power. Use those words. Never use 6dB to mean doubling.

This admonition is because when you double voltage and give the answer in power, the number **two** shows up twice. It can be quite confusing.

Power is voltage times current. If you double the voltage across a load the current doubles as well as the voltage. So power is doubled twice; the two is squared. See the two twos? In dB when you multiply you add, but when you square you multiply. The first two is 3dB the second two is the square which is **two-times**. In this case two times the 3dB. (There’s the 6.)

The power gain is the square of whatever the voltage gain is. If you were to make a dB table of power and voltage (the voltage needed for that power), the power column of dBs is squared at each step. Squaring in dB is times two. So the power column gets larger faster by exactly a factor of two. Imagine a Squaring Table; 1,2,3,4 dB on voltage side, 2,4,6,8, dB on the watts side. An 11 dB gain in voltage is next to a 22 dB gain in power. (Note I said gain, so I don’t use dBm.)

The phrase “3 dB” makes us sound smarter than the word double. There is no additional information in the characters; “3dB”. When that’s in reference to a voltage gain that is applied to

a power device we use our imaginary squaring table where a 3dB gain in voltage on the left column corresponds to 6dB on the right.

Correct: "a doubling in voltage is a 6 dB of gain in power."

Never say "a doubling in voltage is 6 dB of gain." (it may not be clear you mean power)

Never say "a doubling in power is 6 dB." (a doubling in power is 3 dB)

Now you know. Now don't use it.

Only use dB gain (or loss) when it is about to be added to (multiplied by) another dB gain term.

Only use dBm if you know you can turn that number into a number of watts but don't want to say "milliwatts" because you want to sound smart.

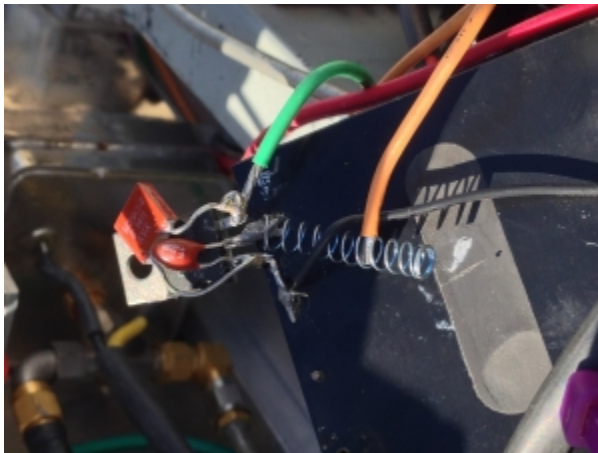
Activity Night

(The Wednesday Before the Meeting; Home Based SBMS get together)

Ken Bourne revealed a problem in the last newsletter concerning a crank-up tower, and microwave antennas on top with the rig in an accessible area at the bottom. This is an important challenge for many SBMSers since activity night (from home) puts a premium on height above your house. But you don't want to put your best rig up there if you also want to take it on field trips. --ed

Larry Johnston K6HLH has this advice on the subject:

As for running waveguide up the tower, you cannot have your cake and eat it too. Lowering the tower to get the 10 GHz rig to go portable would not be an easy task. Flexible waveguide is not cheap. I have about a 200 foot run from the house to the top of the tower, so the 10 GHz station has to be on top of the tower and I use 144 MHz to drive the 10 GHz transverter. The VHF signal is run through a 1 and 5/8 coax from the house to the base of the tower and 7/8" coax up the 60 foot crank up tower.



Ball Point Pen Saves the Day

This is Pat Coker's power supply for his 10 GHz amplifier repaired with no solder no wire strippers out in the middle of nowhere.

Interesting Article on [MW] email group

The following letter started a very active thread for the next several days on the Microwave Email Group. This is a subject that our own Eric Fort has given a

presentation on. And I believe this subject is of interest to Ed Munn and some folks in San Diego; ***commercial WiFi hacked for ham use.-ed***

I expect many of you noticed the cover of QST a couple of months ago that showed (so called) High Speed Multi Media operation. It is based on repurposed Part 15 WiFi hardware and operates under Part 97 rules (Amateur Radio).

I am involved with a group in Seattle called Northwest Mesh. We are attempting to create a high-speed mesh network, mostly at 2.4GHz. I doubt I have to tell many of you that 500mW of 2.4GHz does not go very far, even with good outside antennas, when trees obstruct what would otherwise be a line-of-sight path. In Seattle we have lots of trees and we are struggling to get data around town.

Increasing transmit power would make a real difference to the viability of the network we are developing BUT.... commercially available bi-directional power amplifiers are very expensive. We are licensed to use much more power than we can afford to generate!

Finally, the point! I am wondering if it might be feasible to create a modest cost, repeatable, bi-directional amplifier design based on available hybrid modules and other "building block". I confess an ignorance and hoping this group might help me fix it.

Basic specification:

Frequency range: 2390 to 2450 MHz

Modulation: 802.11g (OFDM, 54Mb/s)

Output power: 10W - more would be nice.

Drive power: 500mW

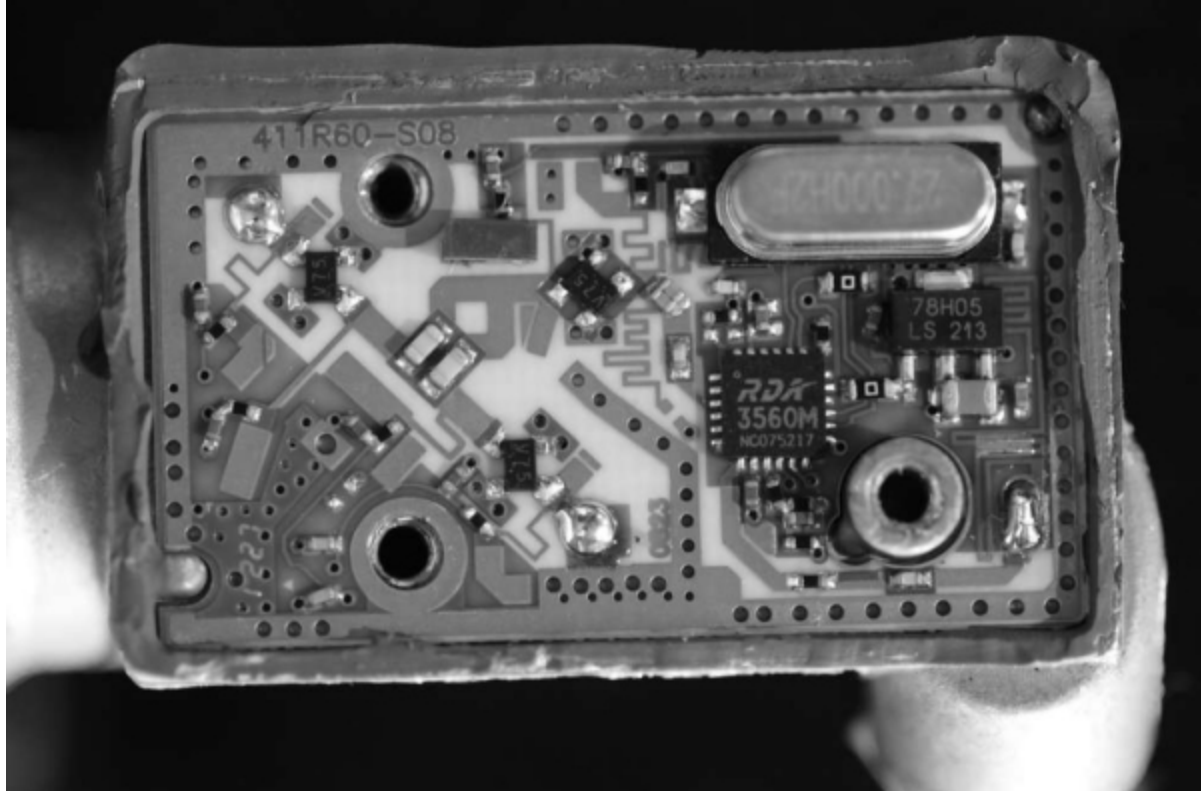
Tx/Rx switching: based on detecting incoming drive power. Fast.

Receive sensitivity: Available radio modems (eg. Ubiquiti Bullet) have a noise floor around -95dBm. It would be preferable that this not be degraded by the bi-directional amplifier.

Rob AE7EG

Ten Dollar Satellite Dish LNB For Use On X-Band

Here, Dennis Kidder has opened one of several LNBs he bought to see in what ways it can be used for amateur use. The potential is fantastic in terms of low noise considering the cost.



Dennis said that unlike older LNBs, most of the receiver complexity is on a single chip; preamp, LO, mixer and IF buffer amp. It comes from RDA Microelectronics in China and the part is a 3560M.

The internal LO only requires an external crystal -- in the case here, 27.000 MHz. This is designed for Ku direct broadcast but from what I have seen of others using it, it is of wide enough bandwidth to cover 10 GHz easily. The current IF is around 600 MHz if memory serves. My bet is that we could easily change out that crystal and put the 10 GHz IF on 430 MHz. Looking at

the photo you can see the two probe inputs each going to an LNA and then into the receiver. Very elegant and simple design.

This is the solution for a low cost 10 GHz receiver ... now all we need is a low cost 10 GHz transmitter!

--Dennis Kidder W6DQ

Here's a link to the LNB Dennis bought:

http://www.ebay.com/itm/Avenger-PLL321S-2-0-1-dB-Universal-Single-Linear-Ku-Band-Satellite-Dish-LNB-LNBF/271099191628?_trksid=p3984.m2045&_trkparms=aid%3D333005%26algo%3DRIC.FIT%26ao%3D1%26asc%3D17405%26meid%3D1027612954393756147%26pid%3D100018%26prg%3D8101%26rk%3D1%26rkt%3D2%26sd%3D271099191628%26

Upcoming SBMS Meeting Tech Talks

- **October 3rd SBMS meeting:** Jim Lux: FINDER - the microwave holy grail of urban search and rescue
- **November 7th SBMS meeting:** Dennis Kidder: History of Receivers part 1

Results of the 10 GHz and Up Contest

Ed Munn is on vacation in Maine but when he returns, they will be posted on this link: http://www.ham-adio.com/sbms/013t_up_results.jpg

For information on other events... see "Activities" in the SBMS website, which, you should have memorized by now

- Google then SBMS
- click on our website
- then Ctrl-F and "Activities"

Needs, Wants and For Sale

For Sale: 30w 1296 MHz PA kit \$50 + \$5 for US shipping Chris Shoaff, N9RIN
cshoaff@yahoo.com

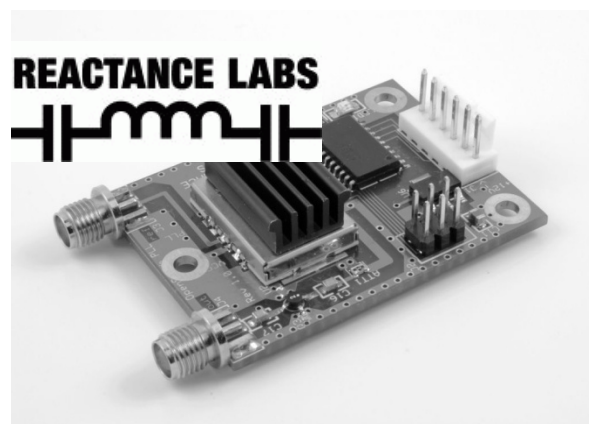
For Sale: 10 GHz slotted waveguide antennas \$55 kit, \$80 assembled plus shipping Dan
W6DFW W6DFW@apex-scientific.com

Need- HP 8694 8-12 GHz sweeper plug-in for 8690 main frame Chuck WA6EXV
760-382-0709

Want- an X-band plug-in for HP8620 sweeper. Bill WA6QYR bburns@mediacombb.net
Want- noise source for NF meter, Bill McNally N6MN billmcn44@verizon.net

Member Ads

60 degrees North Electronics Company. I am starting up a kit making service for assembling certain kits made by Down east Microwave. For those that do not want to make their own kits or maybe it's gotten too difficult, or just don't have the time or want assembled kit faster than DEMI can supply it. This one-man business so I will only be able to build a limited number per month. My price is the same as offered by DEMI assembled, plus shipping which should be medium-size flat-rate priority mail in the US. I am expecting to be able to deliver within 30 days of receipt of paid order. Contact Ed Cole: <http://www.k17uw.com/60NE.htm>



Introducing the **OpenSynth** line of frequency synthesizer kits. Available in standard frequencies of 2556, 2952, 2160, 1152, 3312, 3006 MHz, also available from 400 MHz to 3500 MHz.

- Low phase noise, Buffered output
- Ultra low noise voltage regulators
- Open Source code and design, made to be modified
- 2" x 1.5", 12V @ 140 mA typical

Available at <http://reactancelabs.com>

About SBMS

The San Bernardino Microwave Society is a technical amateur radio club affiliated with the ARRL having a membership of over 90 amateurs. The focus of the club is microwave activities in the Southern California. ***Our sister club is San Diego Microwave Group (SDMG). At least one meeting a year are joint meetings.*** SBMS dues are \$15 per year, which includes a badge and that's about it. The dues are more in the way of a donation to pay for outreach things such as video portals, a bank account, and rent for the building. When to pay is not a matter of remembering. The Corresponding Secretary will contact you by email and will then hound you like your own personal PBS telethon. Dues can be handed to the treasurer at the meeting, or mailed to the address of the treasurer listed in the banner below.

Meetings are first Thursday of the month, 7:00 PM at the American Legion Hall, Corona. For carpooling from North Orange County call Walter Clark @ 714 882-9647

The Reflector (SBMS Group Email)

The most active method of information exchange is our group email called the SBMS Reflector. You don't need to be an SBMS member to participate. To subscribe fill out the form at the website: <http://lists.altadena.net/mailman/listinfo/sbms> (If you are getting email on the SBMS Reflector now, and you want to write your own message, pull up a recently received message, click on "Reply to List." Don't forget to change the subject line and delete all previous text as appropriate.)

The SBMS Website and Newsletter

The SBMS Reflector is ephemeral. There's no record kept. The Newsletter has a slightly longer life. It is sent to members and past issues are recorded in the website. It's URL is: <http://www.ham-radio.com/sbms/> You don't have to memorize that or write it down, just enter SBMS into any internet search engine.

Newsletter: Walter Clark: walterClark@roadrunner.com

Website: Rein Smit: rein0zn@ix.netcom.com

The newsletter is created about the middle of the month and broadcast as a link inside an eMail letter to the members. This is mailed to you on the weekend prior to each meeting. SBMS Newsletter and website material can be copied as long as SBMS is identified as source.

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